Instructions for seminars from Numerical Analysis:
Numerical integration

Most of the methods from the course are implemented in document `integral.mw`. You should add the Richardson's extrapolation. You will be expected to be able (even without a program) to use these methods, estimate errors and an adequate step length. During experiments, you can choose mainly the method, the integrand, and the step. For integrals, e.g.,

A. $\int_0^2 \sin\sqrt{x}\,dx,$

B. $\int_0^2 \sin(x\sqrt{x})\,dx,$

you should pay attention mainly to the following questions:

1. comparison of methods of different orders,

2. comparison of

   (a) analytical estimate of the error,
   (b) estimate of the error by integration with two different steps,
   (c) real error,

3. the dependence of the error on the step length (how much it corresponds to the expected outcome),

4. estimates of the number of steps necessary for a given precision,

5. modifications of the tasks which facilitate the numerical integration, in particular substitutions, e.g., $x = a + u^c$, $x = b - u^c$, where $c > 1$.